

I claim:

- 1 1. A method for shaping surfaces comprising the steps of using
2 reactive atom plasma processing for shaping damage free surfaces.

- 1 2. The method of claim 1 wherein the process is carried out at about
2 atmosphere temperature.

- 1 3. The method of claim 1 for shaping optical elements.

- 1 4. The method of claim 1 for shaping elements out of silicon.

- 1 5. The method of claim 1 for shaping silica glass optics.

- 1 6. The method of claim 1 for shaping aspheric optics.

- 1 7. The method of claim 1 operating in a subtractive manner.

- 1 8. The method of claim 1 that does not leave behind a contaminated
2 redeposition layer.

- 1 9. The method of claim 1 using a plume of plasma.

- 1 10. The method of claim 1 using a plume of plasma operating as a sub-

2 aperture tool.

1 11. The method of claim 1 wherein a plume of plasma is translated
2 across a workpiece.

1 12. The method of claim 1 wherein the emission spectrum is monitored
2 to determine process rates.

1 13. The method of claim 1 using carbon tetrafluoride (CF₄) in argon to
2 create the plasma.

1 14. The method of claim 1 using C₂F₆ in argon to create the plasma.

1 15. The method of claim 1 using silicon hexafluorine (SF₆) in argon to
2 create the plasma.

1 16. An apparatus for shaping surfaces comprising:
2 a chamber;
3 a torch located in a chamber that can produce a plume of plasma;
4 a device that holds a workpiece; and
5 a mechanism for translating the torch across the workpiece.

1 17. The apparatus of claim 15 including:

2 a device for tuning the plasma.

1 18. The method of claim 1 operating an additive manner.

1 19. The method of claim for removing damage introduced by previous
2 process steps.

1 20. The method of claim 1 for removing surface roughness.